

ADCPs: Today's Tool for Measuring Water Currents & Discharge

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There is a growing need for improved use, control, and availability of inland waters. And meeting this need requires better instrumentation for accurately measuring currents in rivers & lakes, and streams & channels. These instruments must operate reliably and survive in difficult conditions for extended periods. For such conditions, the Acoustic Doppler Current Profiler (ADCP) has proven operational and performance advantages. This versatile tool is a single device that can deliver a wide scope of measurements for monitoring water resources. Since 1985, ADCPs have become widely used and accepted by agencies such as United States Geological Survey, U.S. Army Corps of Engineers, Environment Protection Authority, U.S. Bureau of Reclamation, and numerous state and local government agencies.

Versatile Tool

Rather than a spinning propeller, the ADCP-- like dolphins and bats-- uses sound to measure its environment. The method is similar to the hand-held radars used in police "speed traps" or at sports events that measure how fast objects are moving. After a sound burst is emitted by the ADCP, echoes are returned from the particles carried by the currents and from the streambed. By analyzing these sound echoes, the ADCP makes four different measurements at once.

1. Speed and direction of water currents are determined at many levels through the water depth--a "current profile".
2. The ADCP's speed-over-ground and path of travel are revealed by echoes scattered by the bed.
3. The ADCP also measures water depth, like an echo sounder.
4. Finally, a map of the spatial distribution of sediments carried by the water (e.g. a sediment plume) comes from the echoes.

This range of data types used individually and collectively permits a single device to make a diverse range of measurements.

- ✓ Surveys of stream and river discharge
- ✓ Monitoring of changes in water currents over time and across the stream or channel
- ✓ Measuring water level changes

The hardware is a compact, low profile, and robust package that houses low-power electronics.



Photo: Peter Burkhardt

Operational Advantages

- ✓ **Rapid measurement.** The ADCP floats on the surface of the water and is moved across the stream to make the measurement. Each crossing typically takes 3 minutes. This short time permits four measurements while still keeping the total time at each site less than 20 minutes.
- ✓ **Confidence.** Having multiple measurements delivers the discharge result plus builds your confidence in its reliability by showing repeatability.
- ✓ **Easy to Use:** The ADCP is easy to use, requires a brief training, and has a simple user display.
- ✓ **Safe:** You do not have to be in the water when using the ADCP. You can operate from either a bridge or use a tag line / pulley system.
- ✓ **Accurate & Complete:** In contrast to measuring just two levels (0.2 and 0.8 of water depth) at selected verticals, the ADCP continuously measures many levels and the depth while crossing the section. This provides a more complete measurement of both the water velocities and the area of the section.
- ✓ **Informative:** The ADCP reveals the velocity structure of the section in fine detail, showing how the speeds vary from top to bottom and side to side.

Because the ADCP uses sound, it can measure remotely and there are no moving parts. This permits several physical advantages compared to cup meters: ADCPs are less susceptible to fouling, do not require annual calibration, and have much reduced maintenance.

